What is claimed is:

1. A NO_X adsorber, comprising:

a substrate; and

a composite material disposed on the substrate, the composite material comprising lithium, a support material, a catalyst, and a second material selected from the group consisting of alkali materials, alkaline earth materials other than lithium, and combinations comprising at least one of the foregoing second materials, wherein the lithium is less than about 5% by weight of the composite material.

2. The NO_X adsorber of Claim 1, wherein the support material is selected from the group consisting of alumina, gamma-alumina, delta-alumina, theta-alumina, zeolite, zirconia, ceria, magnesium oxide, titania, silica, and mixtures comprising at least one of the foregoing catalysts.

3. The NO_X adsorber of Claim 1, wherein the catalyst is selected from the group consisting of platinum, rhodium, palladium, ruthenium, iridium, osmium, copper, nickel, cobalt, chromium, iron, manganese, rare earth metals, and alloys and mixtures comprising at least one of the foregoing catalysts.

4. The NO_X adsorber of Claim 1, wherein the second material is selected from the group consisting of sodium, potassium, cesium, rubidium, barium, magnesium, calcium, strontium, and alloys and mixtures comprising at least one of the foregoing second materials.

5. The NO_X adsorber of Claim 1, wherein the substrate is selected from the group consisting of cordierite, metal, silicon carbide, refractory oxide, NZP, mullite, and mixtures comprising at least one of the foregoing substrates.

6. The NO_X adsorber of Claim 1, further comprising a three-way catalyst component positioned downstream of the adsorber or as part of the adsorber.

7. The NO_X adsorber of Claim 1, wherein the alkali material is about 2 to about 30 weight percent of the composite material, the catalyst is about 0.2 to about 5 weight percent of the composite material, and the lithium is about 0.1 to about 2 weight percent of the composite material.

8. The NO_X adsorber of Claim 7, wherein the alkali material is about 5 to about 15 weight percent of the composite material, the catalyst is about 0.5 to about 2 weight percent of the composite material, and the lithium is about 0.2 to about 0.7 weight percent of the composite material.

9. The NO_X adsorber of Claim 1, wherein the catalyst comprises a precious metal, and wherein the composite material has a lithium to precious metal weight ratio of less than about 1.5.

10. The NO_X adsorber of Claim 9, wherein the lithium to precious metal weight ratio is about 0.2 to about 1.

11. A method for reducing the level of NO_X in an internal combustion engine exhaust gas, comprising:

exposing the exhaust gas to a NO_X adsorber during a lean cycle, wherein the NO_X adsorber comprises a substrate and a composite material disposed on the substrate, the composite material comprising: a catalyst, lithium, a support material, and a second material selected from the group consisting of alkali materials, alkaline earth materials other than lithium, and combinations comprising at least one of the foregoing second materials, wherein the lithium is less than about 5% by weight of the composite material;

trapping the NO_X in the absorber; and,

reducing the NO_X during a rich cycle.

12. The method of Claim 11, wherein the support material is selected from the group consisting of alumina, gamma-alumina, delta-alumina, theta-alumina, zeolite, zirconia, ceria, magnesium oxide, titania, silica, and mixtures comprising at least one of the foregoing catalysts.

13. The method of Claim 11, wherein the catalyst is selected from the group consisting of platinum, rhodium, palladium, ruthenium, iridium, osmium, copper, nickel, cobalt, chromium, iron, manganese, rare earth metals, and alloys and mixtures comprising at least one of the foregoing catalysts.

14. The method of Claim 11, wherein the second material is selected from the group consisting of sodium, potassium, cesium, rubidium, barium, magnesium, calcium, strontium, and alloys and mixtures comprising at least one of the foregoing second materials.

15. The method of Claim 11, wherein the substrate is selected from the group consisting of cordierite, metal, silicon carbide, refractory oxide, NZP, mullite, and mixtures comprising at least one of the foregoing substrates.

16. The method of Claim 11, further comprising disposing a three-way catalyst downstream of the adsorber.

17. The method of Claim 16, wherein the three-way catalyst is part of the adsorber.

18. The method of Claim 11, wherein the composite material comprises, based upon the total weight of the composite material, about 2 to about 30 wt% of the second material, about 0.2 to about 5 wt% of the catalyst, and about 0.05 to about 5 wt% of the lithium.

19. The method of Claim 18, wherein the composite material comprises, based upon the total weight of the composite material, about 5 to about 15 wt% of the second material, about 0.5 to about 2 wt% of the catalyst, and about 0.1 to about 2 wt% of the lithium.

20. The method of Claim 19, wherein the composite material comprises, based upon the total weight of the composite material, about 0.2 to about 1 wt% of lithium.

21. The method of Claim 11, wherein the catalyst comprises a precious metal, and wherein the composite material has a lithium to precious metal weight ratio of less than about 1.5.

22. The method of Claim 21, wherein the precious metal weight ratio is about 0.2 to about 1.